

K-6

Primary Science and Technology

Diversity & Classification



Teachers' Guide

Diversity and Classification

MODULE 1: K – 2

MODULE 2: 3– 4

MODULE 3: 5– 6

Preface

The development of learning outcomes for the core curriculum in OECS primary and lower secondary schools is an essential part of the harmonization of OECS educational systems. The curriculum harmonization process commenced seven years ago with discussions between the OECS Education Reform Unit (OERU) and educational personnel in all member countries (See *Eastern Caribbean Education Reform Project: Initiative on curriculum and remediation – Design Mission report, February 1998*).

The initiative in Primary Secondary Science and Technology commenced in 2001, with a meeting of science and technology educators in St. Vincent and the Grenadines. Time was spent initially on defining science and technology, mainly because the primary curriculum concentrated on science only. A working definition has been developed and has been used consistently throughout the development of the programme.

Draft learning outcomes were developed and circulated for comments throughout the curriculum units in the OECS. Subsequent meetings of the working group were held in St. Kitts and Nevis, St. Lucia and Antigua and Barbuda. At each of these meeting teacher educators, teachers and principals formed part of the discussion groups. After the learning outcomes were adopted by the curriculum officers, instructional modules to serve as teachers' guides were planned and developed by members of the working groups. The learning outcomes and modules were all reviewed and edited by the two consultants who worked through all phases of the project.

Time did not permit a formal piloting of the learning outcomes and modules. Since in most cases the same curriculum officer worked on the lower secondary curriculum also, there is the possibility of the primary curriculum benefiting from the experience gained in the piloting of the lower secondary programme.

The purpose of developing the learning outcomes and instructional modules is to ensure that all children in OECS primary schools attain an acceptable level of knowledge, skills and attitudes associated with science and technology. Each member country retains the right and responsibility for integrating these outcomes into the national primary science and technology curriculum. As usual, teachers will continue to use their initiative and resourcefulness in the implementation of the programme through the use of indigenous resources creating relevance.

The OERU is extremely grateful for the contribution made by all persons and institutions that have been involved in this developmental exercise. First, OERU expresses thanks to the Canadian International Development Agency (CIDA) for the high level of interest shown and the funding provided for the Eastern Caribbean Education Reform Project (ECERP). The Ministries and Departments of Education have contributed resource personnel, accommodation, refreshment, ground transportation, and some materials for workshops. Most important, however, have been the high level of cooperation and commitment to the reform effort displayed by both the administrative and professional sections of Ministries of Education.

The following science education professionals have made significant contributions over the four-year period.

Country	Participant	Designation
Anguilla	Mr. Worrell Brooks	Education Officer, Science
	Mrs. Maria Webster	Secondary School Teacher
Antigua and Barbuda	Mr. Earl Skerritt	Science Coordinator
	Ms. Kendra Thomas	Primary School Teacher
	Ms. Celia Frederick	Secondary School Teacher
	Ms. Gracelyn Ireland	Primary School Teacher
British Virgin Islands	Ms. Beverlie Brathwaite	Education Officer, Science
Dominica	Mr. Frank Newton	Education Officer Science
	Mr. Gerald Corbette	Lecturer, Dominica State College
Grenada	Mr. Jervis Viechweg	Curriculum Officer, Science
	Ms. Janis Henry	Lecturer, T. A. Marryshow Com. College
Montserrat	Mr. Gregory Julius	Primary school Principal

St. Kitts And Nevis	Mr. Hilton Clarke	Curriculum Officer, Science
	Dr. Lincoln Carty	Former Curriculum Officer, Science
St. Lucia	Mr. Winston Blanchard	Curriculum Officer, Science
	Ms. Imelda Polius	Former Primary School Teacher
St. Vincent and the Grenadines	Mrs. Arlene Keane-Browne	Former Curriculum Officer, Science
	Mrs. Amaala Muhammad	Curriculum Officer, Science
	Mr. Kenroy Johnson	Principal, Secondary School

The OERU also expresses gratitude to the dozens of teachers, principals and students who have participated in discussions and consultations.

The actual planning and subsequent developmental process for the learning outcomes and Teachers' Guide became the responsibility of Dr. Cheryl Remy, former Senior Lecturer at Sir Arthur Lewis Community College, St. Lucia, and Professor Winston King, Senior Lecturer, School of Education, UWI, to whom the OERU is very grateful. As a team, Dr. Remy and Professor King have encouraged workshop participants and module writers to think and to create ideas as the work progressed.

The staff at OERU together contributed in no small measure to these modules. Ms. Deborah Alphonse, Accounts/Administrative Assistant, Ms. Natasha Deterville, now Secretary to the Director of Economic Affairs in the OECS, and Ms. Cleotha Randolph, Documentation Officer, worked tirelessly arranging workshops and reproducing materials. Ms. Natalie Compton of Nagio Creations competently designed the layout of the modules and learning outcomes for printing and electronic reproduction.

Dr. Henry Hinds, formerly Curriculum Specialist at OERU, was responsible for the curriculum project. Mrs. Lorna Callender and Ms. Candia Alleyne, both former Heads of OERU, have supported the project organizationally and morally. Mr. Johnson Cenac, ECERP Officer, made significant contributions in various ways and at various times throughout the development of this work.

The Primary Science and Technology modules provide an excellent example of the fusion of talent, creativity, rigorous science and technology and cooperation to develop a valuable resource for teachers.

The OERU hopes that principals and teachers will continue to play their roles in making the outcomes and modules come to life in classrooms throughout the OECS. The commitment and effort surely will contribute to the enhancement of knowledge, and skills and the development of positive attitudes towards science and technology.

Henry Hinds, Head, OERU

August, 2006

Diversity and Classification

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RATIONALE

The natural environment of the Caribbean provides a rich variety of flora and fauna that can stimulate children’s curiosity and investigative abilities.

Young children of primary school age should be given the opportunity to learn about their immediate environment so that they can appreciate the beauty and usefulness of plants and animals around them. This opportunity should encourage them to appreciate the Caribbean environment and to develop an awareness of the need for its sustainable use and development.

The activities in these modules also provide students with a firm foundation for many concepts such as variety and variation, diversity, classification, that they will encounter later in their study of Science and Technology.

INTRODUCTION

In these modules the children will progressively classify the great diversity of things in their environment into living and non-living things and then the living things into plants and animals. The children will begin to appreciate the similarities in living organisms while they learn how these common characteristics can be more easily studied and understood by the use of classification systems.

Students, even from the Kindergarten stage, will engage in closely observing living things and in devising classification schemes. They will have the chance to investigate how human beings use the resources in their environment (in this case, plants and animals) to meet their needs and solve their problems. Attitudes such as curiosity, cooperation and stewardship of the environment are encouraged throughout the modules, and students engage in using the methods of Science and Technology in the suggested activities.

THE EXPERIENCES IN THESE MODULES WILL HELP THE STUDENTS TO DEVELOP THE FOLLOWING MAJOR IDEAS:

DIVERSITY AND CLASSIFICATION

The environment is made up of a variety of plants and animals,

These may be grouped according to their similarities,

TECHNOLOGY

Technological methods involve the use of problem solving, technological processes and resources to find solutions to people's wants and needs.

Technology is a human activity.

Individuals can take part in Technological activity.

Technology involves the uses of materials, energy, tools/machines and information.

Technology processes include Biotechnology, Production Technology and Transportation.

Technology changes over time.

Technology is neither good nor bad, but the way we use it can have positive or negative effects on our lives.

The use of technology has side effects.

SCIENCE TECHNOLOGY, SOCIETY AND THE ENVIRONMENT

Science and Technology affect human life, the society and the environment.

The impact of Science and Technology can be positive or negative, unplanned or planned, immediate or delayed.

There should be sustainable use of resources and efforts should be made to minimize ecological disturbances.

People's values, beliefs and attitudes influence Scientific and Technological activity and use.

DIVERSITY AND CLASSIFICATION

MODULE 1

GRADES K - 2

GRADES K – 2

DIVERSITY AND CLASSIFICATION

GENERAL OBJECTIVES

The students should be able to:

1. Recognize that animals (including human beings) and plants are living things.
2. Appreciate the wide variety of animals and plants.

SPECIFIC OBJECTIVES

The students should be able to:

1. Name some living and non-living things.
2. Classify living and non-living things.
3. Classify animals on the basis of characteristics such as their size, body coverings, and the food they eat.
4. Make a presentation displaying living and non-living things (e.g. a collage).
5. Name some characteristics of living things.
6. Role play the behaviour or habits of some animals.
7. Identify, by sight or by sound, a wide variety of animals.
8. Make a representation of animals (e.g. scrapbook).
9. Define : i. Plant ii. Tree iii. Shrub iv. Vine v. Herb.
10. Identify different kinds of plants.
11. Name two types of leaves that are found in plants.
12. List different uses of leaves in every day life.

LEVELS OF ATTITUDES, SKILLS & TECHNOLOGY EXPECTED AT GRADES K - 2

ATTITUDES:

Students should be encouraged to:

Curiosity:	<ul style="list-style-type: none"> ✓ Ask questions about objects and events. ✓ Find out more about events and objects on their own.
Inventiveness:	<ul style="list-style-type: none"> ✓ Suggest new ways of doing things.
Respect For Evidence	<ul style="list-style-type: none"> ✓ Explain their results and conclusions. ✓ Listen to other students' results and explanations.
Persistence	<ul style="list-style-type: none"> ✓ Complete activities. ✓ Persist at tasks.
Respect For Living Things	<ul style="list-style-type: none"> ✓ Show sensitivity to living things.
Cooperation	<ul style="list-style-type: none"> ✓ Share with others. ✓ Work together with others.
Concern For Safety	<ul style="list-style-type: none"> ✓ Observe safety instructions.

SKILLS:

In developing their skills of inquiry, problem solving and design, the students are expected to:

Observing	<ul style="list-style-type: none"> ✓ Use as many senses as are appropriate and safe to gather information. ✓ Identify differences and similarities between objects and events. ✓ Identify sequence in events.
Measuring	<ul style="list-style-type: none"> ✓ Use simple measuring instruments or models of measuring instruments. At first use comparative terms such as bigger, smaller and later use actual figures.
Manipulating	<ul style="list-style-type: none"> ✓ Set up simple experiments to compare results. ✓ Manipulate simple equipment.
Recording	<ul style="list-style-type: none"> ✓ Use pictures and charts to report results. ✓ Fill out simple tables to report results
Classifying	<ul style="list-style-type: none"> ✓ Group objects according to one criteria or two criteria.
Communicating	<ul style="list-style-type: none"> ✓ Talk freely about their activities and the ideas they have, with or without making a written record. ✓ Use appropriate vocabulary to describe their observations. ✓ Listen to others' ideas and look at their results. ✓ Report events by using demonstrations, role play, simple drawings, paintings and simple sentences.
Inferring	<ul style="list-style-type: none"> ✓ Notice patterns in simple measurements and events.
Interpreting data	<ul style="list-style-type: none"> ✓ Discuss what they find out in response to questions.
Experimenting	<ul style="list-style-type: none"> ✓ Freely ask a variety of questions and suggest how they might be answered. ✓ Suggest how they could investigate to find out answers to questions.
Predicting	<ul style="list-style-type: none"> ✓ Attempt to make predictions (even if not based on patterns).
Problem Solving	<ul style="list-style-type: none"> ✓ Suggest solutions to simple problems.
Designing	<ul style="list-style-type: none"> ✓ Construct models either by following instructions or by using their own designs. ✓ Select appropriate material to make models and gadgets.

<p><u>Technological Methods</u></p>	<ul style="list-style-type: none"> ✓ Given problems, the students will be able to discuss and make simple gadgets.
<p>Nature Of Technology</p>	<ul style="list-style-type: none"> ✓ Realize that people use natural things and also make other things from them. ✓ Realize that they can design and make things which may be different from what others make. ✓ Share information with others. ✓ Realize that safety is important in using tools and making things.
<p><u>Use Of Technology</u></p>	<ul style="list-style-type: none"> ✓ Appreciate the use of devices, tools and structures made by humans in the home and community . ✓ Appreciate the advantages of using these products. ✓ Realize that human-made things can pollute the environment.

UNIT: DIVERSITY AND CLASSIFICATION (GRADE K)

Topic: Living and Non-living things

Duration: 5 Lessons

Specific Objectives

Students should be able to:

- Name some living things.
- Name some non-living things.
- Classify living and non-living things.

Process Skills

Observation; Classification; Inference

Materials

School's Environs (surroundings) or Field/Trip. Charts of Living Things and Non-Living Things

Content Summary

Scientists have been making and continue to make classifications of various objects and living organisms. Classification contributes to organized information and makes learning easier.

In our homes and schools we are involved in grouping things. This is an important way of life. Therefore students at an early stage need to be able to classify or group things around them and develop their skill of observation.

Students live in an environment made up of living and non-living things and should be knowledgeable about living things being plants and animals. They need to develop the skills which will assist them in distinguishing between plants and animals.

Living things – have life: (feed, have young ones) e.g. plants, animals

Non-living things – have no life: e.g. stone, water

Living things are either plants or animals. Non-living things can be grouped as solid (rocks), liquid (water), or gas (air). Non-living things can be either useful or of no use to us.

Suggested Activities

Activity 1

- Take students on a walk around the school's grounds to observe living and non-living things.
- Use these observations to stimulate the discussion on living and non-living things.

Activity 2

- Students collect pictures of living and non-living things and make a 'Portfolio' of Pictures and Names.

Activity 3

- Show a video of animals in their natural environment, Zoo etc.

Activity 4

- Students play a game where some imitate animals and other students try to identify the animal.

Activity 5

- Students identify living things as either plants or animals. Use flashcards marked animals or plants and allow students to place them beside each living thing.
- Students classify non-living things as solids, Liquids and gases.
- Students classify non-living things as useful or not useful.

Assessment

Stick pictures of living and non-living things correctly on the chart.

Living Things	Non-Living Things

Topic: There is a wide variety of animals

Duration : 2 Lessons

Specific Objectives

Students should be able to:

- Classify animals on the basis of their size, body covering, and the food they eat.

Process Skills

Observation

Classification

Inference

Materials

Charts of Animals

Video Presentation of Animals
(Natural Habitats, zoo, etc.)

Content Summary

Some animals are similar in size, some have the same body covering – hair/fur, scales, feathers. Some animals eat similar foods while others eat different foods. Some eat grass/plants, some eat other animals, others eat both plants and animals.

Some groups would overlap – Birds are covered with feathers, but some eat seeds, while others eat flesh.

Some flesh-eating animals are covered with fur, some with scales and some with feathers.

Suggested Activities

Let students group cut-out of animals under size, body covering and food they eat.

Use a Worksheet with the various columns:

Animals/ Size/ Body covering/ Food they eat and have students group and indicate their size, body covering and food they eat.

Animals	Size	Body Covering	Food They Eat

Assessment

Let students group animals and explain the basis of their grouping.

Unit: **DIVERSITY AND CLASSIFICATION**
 (Grade 1)

Topic: **Different animals make different sounds**

Duration : **2 Lessons**

Objective

Students should be able to:

- Identify by sight or by sound a wide variety of animals.

Process Skills

Observation

Classification

Inference

Communication

Materials

Pictures of Animals

Video of Animals

Tape Recorder / Cassette Player

Audio Tapes

Content Summary

Animals have specific names and make unique sounds. For example, dogs bark, ducks quack, horses neigh, sheep bleat, cows moo, pigs oink, birds chirp.

Suggested Activities

Using a cassette player students listen to sounds animals make and identify the animal making the particular sound.

Let students make sounds of different animals.

Students are given pictures of animals and asked to name them. (orally)
Students are given flash cards with names of animals and are asked to find their partner with the picture of the animals.

Show a video of animals in their habitat, zoo etc. and let students name these animals.

Assessment

Students play sound Bingo

Topic: My Book of Animals

Duration: 2 Lessons

Specific Objectives

Students should be able to:

- Make a representation of animals.
- Complete scrapbooks, portfolios, projects and posters.

Process Skills

Classification

Communication

Materials

Pictures of Animals

Flash cards

Posters

Slogans

Content Summary

Students' displays will include concepts of classifying animals according to size, body coverings, and the food they eat. Some may have captured the animal's habitat. Some may highlight their favourite animals and pets. Some may capture the meaning of endangered animals and characteristics of animals.

It is important to note that this is the students' completed work.

Suggested Activities

The completed scrapbooks, portfolios, projects, posters etc., of students are displayed and then returned to the students.

Suggested Assessment

1. Use a checklist
2. Allow students to give oral presentations of their work – scrapbooks, portfolios, projects etc.

Topic: Animal Behaviour:

Duration: 2 Lessons

Specific Objectives

Students should be able to:

- Imitate the behaviour of an animal.
- Role-play a day in the life of their pet.

Process Skills

Observation

Communication

Interpretation

Materials

Students – Costumes where possible

Content Summary

Animals make different sounds and movements. Animals behave differently when feeding as well.

Suggested Activities

Role-playing of animals by students.

Assessment

Students take turns to role-play animals – other students guess which animal is being portrayed.

Unit: DIVERSITY AND CLASSIFICATION (GRADE 2)

Topic: Human Variation

Duration: 2 Lessons

Specific Objectives

Students should be able to:

1. State ways in which people are alike and are different.
2. Group themselves according to similarities.

Process Skills

Observation, Classification, Inference.

Materials

Use students themselves for this activity.

Content Summary

Animals have similarities which are used to classify them into certain groups.

Students should recognize the similarities of animals as they organize their specific groups.

People are similar and are different in many ways: colour of skin, colour of eyes, height, weight, colour of hair and gender.

Suggested Activities

Students make groups of themselves, with similar weight.

Students group themselves according height.

Student design and make a poster of their names listing their height and weight.

Topic: Living and Non-living Things

Duration: 2 Lessons

Specific Objectives

Students should be able to:

- Make a presentation displaying living and non-living things.

Process Skills

Observation, Classification, Communication

Materials

Charts of living and non-living things

Samples of non-living things

Samples of living things

Concept maps

Posters of favourite animals

Posters of endangered animals

Portfolios/ scrap books

Content Summary

Students can communicate to others their methods of classifying living and non-living things. The opportunity must be provided for students to display their work and make presentations on their findings. They should be encouraged to accept responsibility. Accepting responsibility can heighten their interest in science.

Students can make groups of living and non-living things. Then further sub-divide living things according to size, body covering and food eaten.

Suggested Activities

Students plan an exhibition and display their posters, models, portfolios, scrapbooks, samples, etc, 'in the multipurpose classroom'.

Students explain their exhibits to students from other classes and parents who are invited to view the exhibition.

Make posters of endangered animals.

Make concept maps and concept webs.

Assessment

Teachers should provide a checklist for assessment of students' work.

Invite students and parents to view the students' exhibition.

Topic: Characteristics of Living Things

Duration: 2 Lessons

Specific Objectives

Students should be able to:

- Name some characteristics of living things such as **reproduction, feeding, moving and growing.**

Process Skills

Observation, Inference, Classification, Communication

Materials

Charts of animals and their young animals feeding

Videos of animals in their habitat

Seeds, soil, jars

Content Summary

Living things, both plants and animals, carry out a series of similar activities. They reproduce, feed, grow, breathe, and respond to stimuli.

Some animals reproduce by laying eggs. In others the young develop inside the females' bodies.

Some plants reproduce by producing seeds. Plants also reproduce by cutting, and suckers. Plants make their own food using sunlight, water and air. Animals depend on plants (directly or indirectly) for food.

Both plants and animals increase their size and weight – this is growth (they get bigger).

Animals move from place to place (walk, swim, fly) – in search of food, shelter, protection (man – pleasure) Plants have very little movement except growth.

Suggested Activities

Activity 1

Students observe animals in their environment (where possible) and/or videos. Use their observations to stimulate class discussion on some characteristics – reproduction, feeding, movement and growth.

Activity 2

Students make charts and/or scrapbooks -
Parents and their young (reproduction).

Activity 3

Students make charts and/or scrapbooks -
Animals eating (feeding).

Activity 4

Students make charts and/or scrapbooks -
Using pictures of animals and movement (movement).

Activity 5

Students make charts and/or scrapbooks -
Display different sizes of an animal. (growth).

Students carry out germination experiment by planting seeds in jars and observing them grow. This activity could be used to establish two characteristics of living things (i) reproduction and (ii) growth.

Assessment

Students make charts, scrapbooks and portfolios and posters:

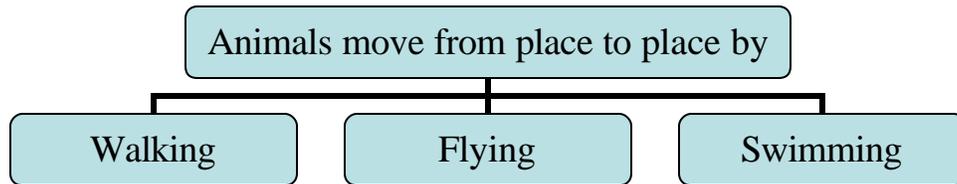
- plants showing different sizes to illustrate plants growth and reproduction.

Students design and make posters illustrating different methods of movement by animals.

- Animals, which fly (animals can be similar and/or different).
- Animals which swim.
- Animals which creep/crawl.
- Animals which can move swiftly etc.

N.B. Students could be organized to complete projects, portfolios, scrapbooks, etc.

Students can make simple concept maps to show the characteristics of movement. (**N.B.** this can be done for any of the characteristics).



Students make posters of animals: those that feed on plants, those that feed on animals etc.

Students make posters of animals, which care for their young.

Topic: How do Plants Differ?

Duration: 3 Lessons

Specific Objectives

Students should be able to:

1. Define: (i) plant (ii) Tree (iii) Shrub (iv) Vine (v) Herb
2. Identify different kinds of plants.
3. Name two types of leaves that are found in plants.
4. List different uses of leaves in everyday life.

Process Skills

Observing, Classifying, Recording, Manipulating, Designing

Content Summary

There are diverse plants existing on earth today. **Plants** vary in size and appearance and may be grouped into different categories such as **trees**, **shrubs**, **vines** and **herbs**.

A **tree** is a perennial plant that has a single self-supporting stem or trunk, which is un-branched for some distance above the ground.

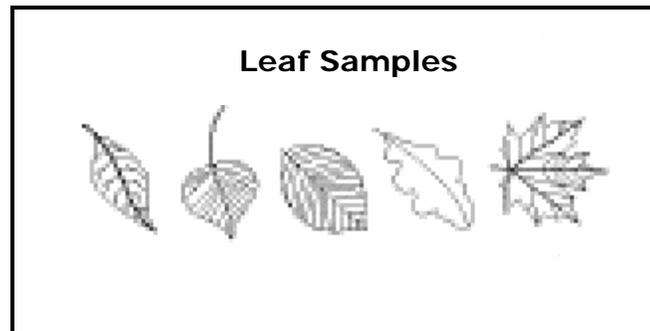
A **Shrub** is a woody plant that is smaller than a tree, and is usually divided into separate stems from near the ground.

A **Vine** (also called a runner) is a plant with slender stems that trail or climb.

A **Herb** is a plant that has a stem that is not woody; it dies after flowering.

The type of leaves that plants have also varies. Leaves may be **simple** or **compound**, have a small or a large **size** and may be of a variety of **shapes** and **colours**. Some leaves have **netted veins** and others have **parallel or straight veins**.

Plant Type	Examples
Trees	mango, avocado, coconut, orange
Shrubs	hibiscus, oleander, tangerine, sage
Vines	potato, yam, pumpkin, melon
Herbs	chives, thyme, carrot, mint



Suggested Activities

1. Students tour their school yard/community in groups to observe plants in general. List names of common plants that are examined. Collect samples of leaves from or photograph each plant that is considered. Use the definition for each type of plant to group the list into trees, shrubs, vines and herbs. Present the result in a table.

Students either collect their own leaf samples or are given samples by their teacher. They sort them into groups using different properties (colour, size, pattern of leaf veins, etc). Present an oral report.

2. Create a collage using a variety of leaves.

Use leaves to do block painting/stamping as an integrated Art and Craft lesson. Examine the pattern of veins in each stamp.

3. Discuss the use of leaves in everyday life. Plan and implement a 'show and tell' in which students present leaves used in different ways.

Suggested Assessment

1. Grade result of each activity above.

DIVERSITY AND CLASSIFICATION

MODULE 2

GRADES 3 - 4

GRADES 3 - 4

GENERAL OBJECTIVES:

GENERAL OBJECTIVES

The students should be able to:

1. Appreciate that there are many different ways of propagating plants.
2. Classify plants according to their method of reproduction.
3. Appreciate that people cultivate plants for their own needs.
4. Classify animals as vertebrates and invertebrates.

SPECIFIC OBJECTIVES

1. Classify plants into flowering and non-flowering, monocotyledons and dicotyledons.
2. Describe the differences between monocotyledonous and dicotyledonous plants.
3. Define propagation.
4. State two natural methods by which flowering plants can be propagated.
5. Define 'seed'.
6. Describe common methods of vegetative propagation.
7. Suggest appropriate methods of propagation for (i.) obtaining diversity and (ii.) keeping the same characteristics in plants.
8. Describe people's use of artificial plant propagation and materials (*production technology*) to satisfy their needs.
9. Identify seeds as a means of reproducing different plants.
10. Define sexual reproduction.
11. Demonstrate respect for plants in their environment.

- 12.Link the seed to sexual reproduction in plants.
- 13.Describe the processes of germination in plants.
- 14.List the factors needed for germination to occur.
- 15.Compare the rate of germination in a variety of seeds.
- 16.Identify seeds as a means of reproducing different plants.
- 17.Define (i.) Vertebrate (ii.) Invertebrate.
- 18.List the five classes of vertebrates.
- 19.Describe the main features of each class of vertebrate.
- 20.Compare the main features/characteristics of the classes of vertebrates.
- 21.Make a model of any vertebrate from 'throw away' items.

**LEVELS OF ATTITUDES, SKILLS & TECHNOLOGY EXPECTED AT
GRADES 3 - 4**

ATTITUDES:

Students should be encouraged to:

Curiosity:	<ul style="list-style-type: none"> ✓ Ask questions about objects and events. ✓ Find out more about events and objects on their own.
Inventiveness:	<ul style="list-style-type: none"> ✓ Suggest new ways of doing things. ✓ Use equipment in novel ways.
Respect For Evidence	<ul style="list-style-type: none"> ✓ Explain their results and conclusions using some evidence. ✓ Listen to other students' results and explanations. ✓ Begin to recognize when conclusions do not fit the evidence.
Persistence	<ul style="list-style-type: none"> ✓ Complete activities. ✓ Persist at tasks.
Respect For Living Things	<ul style="list-style-type: none"> ✓ Show sensitivity to living things.
Cooperation	<ul style="list-style-type: none"> ✓ Share with others. ✓ Work together with others. ✓ Accept responsibilities.
Concern For Safety	<ul style="list-style-type: none"> ✓ Observe safety instructions.

SKILLS

SKILLS:	In developing their skills of inquiry, problem solving and design, the students are expected to:
Observing	<ul style="list-style-type: none"> ✓ Use as many senses as are appropriate and safe to gather information. ✓ Identify differences and similarities between objects and events. ✓ Identify sequence in events.
Measuring	<ul style="list-style-type: none"> ✓ Use simple measuring instruments or models of measuring instruments. At first use comparative terms such as bigger, smaller and later use actual figures.
Manipulating	<ul style="list-style-type: none"> ✓ Set up simple experiments to compare results. ✓ Manipulate simple equipment.
Recording	<ul style="list-style-type: none"> ✓ Use pictures and charts to report results. ✓ Fill out simple tables to report results.
Classifying	<ul style="list-style-type: none"> ✓ Group objects according to several criteria.
Communicating	<ul style="list-style-type: none"> ✓ Talk freely about their activities and the ideas they have, with or without making a written record. ✓ Use appropriate vocabulary to describe their observations. ✓ Listen to others' ideas and look at their results. ✓ Report events by using demonstrations, role play, simple drawings, paintings and paragraphs. ✓ Use bar graphs, pictures, tables and charts to report results. ✓ Use books and other sources to find information.

SKILLS CONT'D

Inferring	<ul style="list-style-type: none"> ✓ Notice patterns and relationships in simple measurements and events.
Interpreting data	<ul style="list-style-type: none"> ✓ Discuss what they find out in response to questions. ✓ Compare their findings with their predictions. ✓ Notice changes when one variable is changed.
Experimenting	<ul style="list-style-type: none"> ✓ Freely ask a variety of questions and suggest how they might be answered. ✓ Suggest how they could investigate to find out answers to questions. ✓ Have some idea of the variable that has to be changed or what different things are to be compared in an investigation. ✓ Suggest equipment, materials and procedure for conducting investigations.
Predicting	<ul style="list-style-type: none"> ✓ Attempt to use evidence in making predictions.
Hypothesizing	<ul style="list-style-type: none"> ✓ Attempt to explain things that are consistent with evidence. ✓ Suggest how something may have happened.
Problem Solving	<ul style="list-style-type: none"> ✓ Suggest solutions to simple problems.
Designing	<ul style="list-style-type: none"> ✓ Construct models either by following instructions or by using their own designs. ✓ Select appropriate material to make models and gadgets. ✓ Formulate problems, do appropriate research, and devise solutions. ✓ Select appropriate material to make models and gadgets. ✓ Evaluate their own designs using simple criteria.

TECHNOLOGY

<p><u>Technological Methods</u></p>	<ul style="list-style-type: none"> ✓ Students will be able to formulate problems, do appropriate research, and devise solutions (e.g. construct gadgets).
<p>Nature Of Technology</p>	<ul style="list-style-type: none"> ✓ Look at past inventions in their historical context. ✓ Understand that products are replicable. ✓ Understand that others may be working on the same idea. ✓ Realise that <i>they can use scientific knowledge in doing technology</i> and that technology helps to develop reliable scientific information. ✓ Understand the importance of precision and safety in developing new products. ✓ Understand that technology is novel and creative. ✓ Understand that if the people in a country are creative and innovative, their country can progress. ✓ Understand that people use processes involving living things (Biotechnology) and materials (Production Technology) to satisfy their needs.
<p><u>Use Of Technology</u></p>	<ul style="list-style-type: none"> ✓ Appreciate the use of devices, tools and structures made by humans in the home and community. ✓ Appreciate the advantages of using these products. ✓ Realize that human-made things can pollute the environment. ✓ Look at advantages and disadvantages to help them make decisions of what is the best technology that can be used in a particular situation. ✓ Realize that people may abuse and misuse technology. ✓ Understand that technology may have unintended consequences.

Unit: CLASSIFICATION AND DIVERSITY (GRADE 3)

Topic: Classifying Flowering Plants

Duration: 3 Lessons

Specific Objectives:

Student should be able to:

1. Classify plants into flowering and non-flowering; monocotyledons and dicotyledons
2. Describe the differences between monocotyledonous and dicotyledonous plants.

Process Skills

Observing, Classifying, Communicating, Investigating, Recording

Attitudes

Curiosity, respect for living things and the environment, stewardship of the environment

Materials

Seed samples (*genip, kidney beans, black-eyed peas, corn, rice, barley, mango, peanuts, etc.*)

Pictures (*flowering and non-flowering plants*)

Multimedia CD-ROM (*information on plant propagation*)

Video (*documentary on plant propagation*)

Computer (*Internet access + CD Drive*)

Up-rooted plant samples

Content summary

Plants can be classified into **flowering** (seed-bearing) or **non-flowering** (non-seed bearing). Sugar cane, mango and corn are examples of flowering plants. Ferns and mosses are examples of non-flowering plants.

Flowering plants can be further classified as into **monocotyledons** and **dicotyledons**. A monocotyledonous plant has one **seed leaf** or **cotyledon** in one of its seeds, **parallel-veined leaves**, **jointed stems** and a **fibrous root system**, while a dicotyledonous plant has two **seed leaves** or **cotyledons**, **net-veined leaves**, **un-jointed stems** and a **tap root system**.

Suggested Activities

1. Students work in groups to look at pictures of plants or go outdoors to look at plants and classify them into flowering and non-flowering, giving three examples in each group.
2. Students work in groups to examine seed samples, by peeling away their seed coats, to see the number of seed leaves/cotyledons present in each. Record the information in a table with two headings –monocotyledons and dicotyledons. (*Use the seeds listed under materials.*)
3. Students work in groups to investigate up-rooted plant samples such as corn and mango (*seedling*) or other monocotyledons and dicotyledons. After describing the leaves, roots and stems in each case, they link their findings to the number of seed leaves present in each type of plant and draw conclusions about the features of monocotyledons and dicotyledons.

Assessment

1. Let students formulate definitions for each of the following: flowering plant, non-flowering plant, monocotyledon, dicotyledon, and give two examples of each.
2. Complete the classification key in figure 1 below.

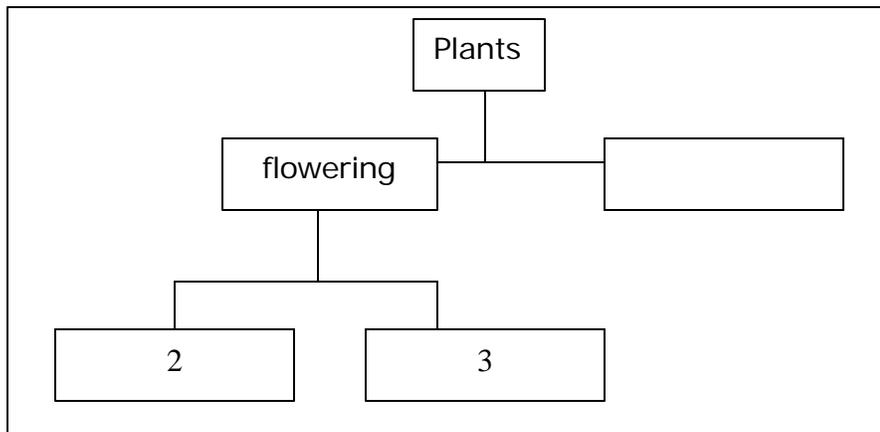


Figure 1: Classification of plants

3. Make a table of differences for monocotyledons and dicotyledons.

monocotyledons	dicotyledons

4. Create a chart/power point presentation/website showcasing flowering and non-flowering plants or monocotyledons and dicotyledons.
5. Engage in a tree planting exercise.
6. Plan and implement a campaign in which posters are made that depict the importance of trees and what people ought to do to preserve them.

Topic: The Different Ways of Growing new Flowering Plants

Duration: 3 Lessons

Specific Objectives

Students should be able to:

1. Define propagation.
2. State two natural methods by which flowering plants can be propagated.
3. Define 'seed'.
5. Describe common methods of vegetative propagation.
6. Demonstrate respect for plants in their environment.
7. Suggest appropriate methods of propagation for (i.) obtaining diversity and (ii.) Keeping the same characteristics in plants.
8. Describe people's use of artificial plant propagation and materials (*production technology*) to satisfy their needs.

Process Skills and Attitudes

Observing, Manipulating, Recording, Caring for the environment

Materials

Plant organs- seeds (monocot, dicot), stem tuber, root tubers, bulbs, corn, runners (vines).

Plants growing from different plant organs.

Charts/texts/websites with diagrams of plant reproductive organs.

Seedlings/Potted plants (*for tree planting exercise*)

Content summary

Propagation is the production of large numbers of new plants. Flowering plants may be **propagated** by **seeds** and/or **vegetatively**.

A **seed** consists of an **embryo** and its food reserves, enclosed in a protective coat. Under suitable conditions, the seed **germinates**. **Germination** is the

initial growth of a seed as it changes into a small plant. This new plant is referred to as a **seedling**. A seedling is capable of becoming a mature plant.

The vegetative production of a new plant involves growing it from existing plant parts such as **root tubers, stem tubers, bulbs, corms, runners/vines and leaves**.

Teacher Notes:

Vegetative Propagation

1. **Leaves** – leaf of life (bryophyllum)can produce hundreds of tiny new plants from buds that grow out of its leaves.
2. **Stem Tubers** – Irish potato has buds or 'eyes'; each bud can produce a new plant.
3. **Bulbs** – Onion, garlic have buds between the leaves; these buds develop into new stems, leaves, and flowers.
4. **Root Tubers** – Sweet potatoes, cassava; each tuber can grow into a new plant
5. **Runners** – have stems that grow out along the ground. A bud at the end of the runner develops roots and leaves and forms a new plant (e.g. water grass).
6. **Suckers** - Banana grows many plants from the original shoot.
7. **Corms** – Short swollen underground stems which develop into new plants (e.g. coco).

New plants may also be produced by **artificial** means. These include:

1. **Cuttings** – sections of stem, which develop root and form new plants. (e.g. cassava, sugar cane, hibiscus)
2. **Tissue Culture** – Here cells are grown in a special fluid containing all the nutrients the plant needs for growth and development. Each cell grows into a new plant. (e.g. banana, carrots, breadfruit, cocoa)
3. **Grafting** – a small twig is cut off and joined to a short stem attached to a good root system of another tree. (e.g. roses, mango).

Suggested Activities

1. Research propagation in flowering plants through the use of multimedia CD-ROM, Encyclopaedia/text, Internet or Resource person. Discuss the findings and or present a report.

2. Field trip: visit a nursery/farm to make observations and be informed about the methods used to propagate flowering plants. Students write a report of the information that is presented.
3. Invite a botanist/agriculturalist to address the students on propagation of flowering plants, to include modern technologies used. Students submit a summary of the information that is presented (*as a follow-up activity*).
4. Research an artificial method of plant propagation. Submit a project report.
5. Small group discussion:
What effect can removing flowers from plants have on the production of new plants of this type? Beside the effect on that plant itself, what other effects can removing flowers have?
6. Students' investigation:
Which type of reproduction is more common in a list of plants (reproduction by seed or without seed) Students make predictions. Students organize to collect, record, and interpret data.
Possible questions: (i.) What will be measured?
(ii.) How will it be recorded?
(iii.) Are there any that use both methods of reproduction?
7. Small group discussion followed by plenary:
You have one mango tree, which bears big sweet mangoes. What method would you use to get new plants, which bear big, sweet mangoes all the time from this tree? Say why you would use the method chosen. Give one reason why people use artificial propagation in plants.
8. Students experiment with growing their own plants by the different methods (seeds, vegetative and artificial methods).
9. Comparison of growth of plant from seed and from organ of vegetative propagation. Growth of that same plant from seed and from organ of vegetation propagation e.g. onion, or compare growth of some seeds with growth from organs of vegetative propagation under similar conditions. Students measure, record and draw conclusions from data.

Assessment

1. Grade project reports/summaries on plant propagation.
2. Suggest appropriate methods of propagation for i. obtaining diversity and ii. Keeping the same characteristics in plants.

3. Describe people's use of artificial plant propagation and materials (*production technology*) to satisfy their needs.
4. Use of tables to record data allowing classification of plants by the way they reproduce.

Example:

Complete the following table on plant reproduction using the Numbered samples (or list of plants).

Tick the correct column.

- | | | | |
|----------------|-----------------|-----------------|----------|
| 1. Corn | 2. Irish potato | 3. Sweet potato | 4. Onion |
| 5. Water grass | 6. Garlic | 7. Bean | |

Plant reproducing by	Plant 1	Plant 2	Plant 3
Bulb			
Seed			
Cutting tuber			
Corm			

5. Use a tree diagram to classify plants by the way they reproduce.

Sample questions on tree diagram:

- (i) Name one plant which reproduces by root tuber.
- (ii) Where would the (named plant e.g. pear) fit into this diagram?

6. Open-ended questions.

Which method of propagation would you use to get hibiscus plants?
Give a reason.

7. Objective-type questions.

Which one of the following reproduces using stem tubers?

- | | |
|-----------------|-----------------|
| A. Sweet potato | B. Irish potato |
| C. Onion | D. Cassava |

8. Complete by ticking the appropriate column.

Reproduction by	Names of plants					
	Plant 1	Plant 1	Plant 3	Plant 4	Plant	Plant 6
Seed						
Bulb						
Cutting Tuber						

Or

Name of plant	Reproduction by				
	Seed	Bulb	Cutting	Tuber	
Corn					
Sweet potato					
Onion					

Topic: Classifying Different Vertebrates

Duration: 3 Lessons

Specific Objectives:

Students should be able to:

1. Define (i.) Vertebrate (ii.) Invertebrate.
2. List the five classes of vertebrates.
3. Describe the main features of each class of vertebrate.
4. Compare the main features/characteristics of the classes of vertebrates.
5. Make a model of any vertebrate from 'throw away' items.

Process Skills

Observing, Classifying, Designing, Manipulating, Communicating, Recording

Materials

Charts/CD-ROM/Website (*with Pictures a variety of vertebrates*)
'Throw away' items (bottles, paper rolls, egg shells, etc.)

Content summary

A **vertebrate** is an animal that has a **backbone** or **spine**, while an **invertebrate** is an animal without a backbone. Vertebrates are divided into five major **groups/classes: Mammals, birds, reptiles, amphibians** and **fish**. Each class of vertebrates has its distinguishing or **characteristic features**, which include: **body covering, breathing organ, type of blood** i.e. **warm-blooded** or **cold-blooded**, and **method of reproduction**.

Suggested Activities

1. Visit a zoo to observe different vertebrates. Gather and record as much information as possible about a variety of them (*teacher determines a good sample/list of animals to visit*). Look at their external bodies (take pictures where possible); see what kind of habitat they have; ask about how they breathe and breed and whether they are cold-blooded or warm-

blooded. Work in groups to classify the animals you saw into five distinct groups. Follow up with oral presentations and discussion.

OR

2. Research Project: Use available resources such as text/CD-ROM/Internet to view pictures of various vertebrates and find out information about them. Look at their external bodies; research what kind of habitat they have, how they breathe and breed and whether they are cold-blooded or warm-blooded. Present the findings as report/chart/slide presentation/website.
3. Tour your neighbourhood to identify any vertebrates present there. Collect the data and draw a bar graph to show the numbers of each type of vertebrate identified.
4. Design and make a model of the vertebrate of choice. Submit with a project report of the procedure.

Assessment

1. Grade the presentation/projects resulting from any of activities 1-4 above.
2. Teacher-made test of objective type questions, True/False and fill in the blanks items. Example:

Test: Classifying vertebrates

Section A – Indicate if the statement is true or false by circling either T or F.

1. All vertebrates have a backbone or spine. (T, F)
2. Amphibians are covered with scales. (T, F)
3. Vertebrates are all warm-blooded animals. (T, F)
4. A mammal is an animal that breathes through lungs. (T, F)
5. Reptiles and fish are covered with scales (T, F)

Section B – Fill each blank space with the correct answer from the list below.

Mammal amphibian reptile bird invertebrate fish

1. The whale is a/an _____ that lives in the sea.
2. A pigeon is an example of a _____.
3. If an animal has scales and gills, then it is a _____.
4. A spider is an example of a/an _____.
5. A cold-blooded animal that lives on land is in the group called _____.

Section C: Multiple Choice - Choose the correct answer for each of these.

1. A warm-blooded animal which has hair/fur and suckles its young is a/an....
 - A. Amphibian
 - B. Fish
 - C. Mammal
 - D. Reptile
2. Both reptiles and fish are covered with
 - A. feathers
 - B. hair
 - C. scales
 - D. skin
3. Which animal is warm-blooded?
 - A. Lizard
 - B. Parrot
 - C. Snake
 - D. Snapper
3. Which of the following does not breathe through lungs?
 - A. Cow
 - B. Dog
 - C. Dove
 - D. Tadpole
4. Which of the following lays eggs?
 - A. Cow
 - B. Donkey
 - C. Rabbit
 - D. Turtle

Unit : DIVERSITY AND CLASSIFICATION (grade 4)

Topic: Producing Plants from Different Seeds

Duration: 4 Lessons

Objectives:

Students should be able to:

1. Identify seeds as a means of reproducing different plants.
2. Define sexual reproduction.
3. Link the seed to sexual reproduction in plants.
4. Define germination.
5. List the factors needed for germination to occur.
6. Describe the processes of germination in plants.
7. Compare the rate of germination in a variety of seeds.

Process Skills:

Observing, Communicating, Investigating, Manipulating

Materials

Seeds
Water
Containers
Centimetre squares graph paper
Observation schedules (worksheet)

Content summary

Plants reproduce either **sexually** and/or **asexually**. In sexual reproduction new plants are grown from **seeds**. Asexual reproduction does not require seeds as new plants are grown from plant parts.

A seed consists of an **embryo** and its food reserves, enclosed in a protective coat. Under suitable conditions, the seed produces a small plant. This small plant is referred to as a **seedling**. A seedling can grow into a mature plant.

Activities

1. Field trip to a farm/nursery.
2. Discuss the importance of seeds for obtaining new plants.
3. Work in groups to set up experiments in which plants are grown from different seeds (for at least one week). Record the results in a daily observation schedule (see activity sheet in Figure 1): record the changes that take place in each seed; observe when roots and shoots appear; measure and record their length daily, plot a graph of length of plant (*X axis*) or number of leaves against (*Y axis*) time (*in days*). Compare the graphs to see which seed grow fastest.
4. Discuss:
 - i. the meaning of germination;
 - ii. the advantages and disadvantages of growing plants from seeds (sexual reproduction).

Assessment

1. Give the meaning of (i.) Seed (ii.) Germination
2. List the factors that are needed for a seed to germinate.
3. State two advantages and two disadvantages of sexual reproduction in plants. Write your answers in the table below.

Advantages	Disadvantages

4. 'Show and tell' about the different plants that they have grown, and then submit their observation schedules to be graded.
5. Grade graph of plant growth over one week.

Work Sheet: Observing Germination

Date: _____ **Class:** _____

Names of group members:

.....

Instructions

Set up seeds in the containers provided. Grow the plants either in water or on moist tissue paper, so that all of the parts can be seen as they grow. Observe the changes for at least 7 days. Record your observations in the table below.

Day	Changes that have occurred
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	
Day 6	
Day 7	

Figure 1: Observation schedule for activity 3

DIVERSITY AND CLASSIFICATION

MODULE 3

GRADES 5 - 6

GRADES 5 - 6

GENERAL OBJECTIVES

The students should be able to:

1. Explain how different organisms reproduce and compare their life cycles.

SPECIFIC OBJECTIVES

The students should be able to:

1. Name different animals and state the method by which they reproduce.
2. Explain the need for reproduction.
3. Explain what the life cycle of an animal is.
4. Describe the life cycle of an animal where the young and adult are alike.
5. Describe the life cycle of an animal where the young and adult are not alike.
6. Classify insects according to their type of life cycle.
7. Describe the role of the butterfly in nature.
8. Compare the human life cycle to that of another animal.
9. Define pollination, cross-pollination and self-pollination.
10. Describe the processes of (i.) Self-pollination and (ii.) cross-pollination.
11. Distinguish between self-pollination and cross-pollination.
12. Classify flowering plants according to the type of pollination they undergo.
13. Name the agents of pollination.
14. Identify pollen grains and ovules as the reproductive cells/gametes in a flower.
15. Define fertilization as the fusion of male and female gametes.
16. Explain how fertilization occurs in a flower.
17. Appreciate the significance of the processes of pollination and

fertilization in plants, as a means of obtaining seeds.

18. Define 'seed dispersal'.
19. List the agents of seed dispersal and give examples of seeds that are dispersed by each method.
20. Explain why it is important for seeds to be dispersed/scattered.

LEVELS OF ATTITUDES, SKILLS & TECHNOLOGY EXPECTED AT GRADES 5 - 6

ATTITUDES:

Students should be encouraged to:

Curiosity:	<ul style="list-style-type: none"> ✓ Ask questions about objects and events. ✓ Find out more about events and objects on their own.
Inventiveness:	<ul style="list-style-type: none"> ✓ Suggest new ways of doing things. ✓ Use equipment in novel ways.
Respect For Evidence	<ul style="list-style-type: none"> ✓ Use evidence to justify their conclusions. ✓ Listen to other student’s results and explanations. ✓ Recognize when conclusions do not fit the evidence. ✓ Change their ideas in response to evidence. ✓ Point out contradictions in reports by their classmates. ✓ Show a willingness to review procedures and evaluate their work.
Persistence	<ul style="list-style-type: none"> ✓ Complete activities. ✓ Persist at tasks. ✓ Repeat experiments when previous attempts have failed.
Respect For Living Things	<ul style="list-style-type: none"> ✓ Show sensitivity to living things.
Cooperation	<ul style="list-style-type: none"> ✓ Share with others. ✓ Work together with others. ✓ Accept responsibilities.
Concern For Safety	<ul style="list-style-type: none"> ✓ Observe safety instructions.

SKILLS:	
In developing their skills of inquiry, problem solving and design the students are expected to:	
Observing	<ul style="list-style-type: none"> ✓ Use as many senses as are appropriate and safe to gather information. ✓ Identify differences and similarities between objects and events. ✓ Identify sequence in events. ✓ Distinguish from many observations those that are relevant to an investigation.
Measuring	<ul style="list-style-type: none"> ✓ Use simple measuring instruments or models of measuring instruments. ✓ Use units in measurement.
Manipulating	<ul style="list-style-type: none"> ✓ Set up simple experiments to compare results. ✓ Manipulate simple equipment.
Recording	<ul style="list-style-type: none"> ✓ Use pictures and charts to report results. ✓ Fill out simple tables to report results.
Classifying	<ul style="list-style-type: none"> ✓ Group objects according to several criteria.
Communicating	<ul style="list-style-type: none"> ✓ Talk freely about their activities and the ideas they have, with or without making a written record. ✓ Use appropriate vocabulary to describe their observations. ✓ Listen to others' ideas and look at their results. ✓ Write reports on their investigations. ✓ Use bar graphs, pictures, tables and charts to report results. ✓ Regularly and spontaneously use books and other sources to check or supplement investigations. ✓ Select appropriate methods to report events. Include drawings, reports and multi-media.

SKILLS CONT'D

Inferring	<ul style="list-style-type: none"> ✓ Notice patterns in data. ✓ Draw reasonable conclusions from data.
Interpreting data	<ul style="list-style-type: none"> ✓ Discuss what they find out in response to questions. ✓ Compare their findings with their predictions. ✓ Make associations with change in variables and results.
Experimenting	<ul style="list-style-type: none"> ✓ Freely ask a variety of questions and suggest how they might be answered. ✓ Formulate problems to be investigated. ✓ Suggest how they could investigate to find out answers to questions. ✓ Plan to conduct investigations. Select equipment, materials and procedures for conducting investigations. ✓ Understand what is a fair test. ✓ Keep appropriate variables constant and vary the independent variable in experiments.
Predicting	<ul style="list-style-type: none"> ✓ Use evidence in making predictions. ✓ Show how they have used evidence in making predictions.
Hypothesizing	<ul style="list-style-type: none"> ✓ Attempt to explain things that are consistent with evidence. ✓ Suggest how something may have happened.
Problem Solving	<ul style="list-style-type: none"> ✓ Suggest solutions to simple problems. ✓ Identify needs, formulate questions, conduct research and design solutions to problems.
Designing	<ul style="list-style-type: none"> ✓ Construct models either by following instructions or by using their own designs. ✓ Select appropriate material to make models and gadgets. ✓ Formulate problems, do appropriate research, and devise solutions. ✓ Select appropriate material to make models and gadgets. ✓ Evaluate their own designs and the designs of others using simple criteria.

TECHNOLOGY

<p><u>Technological Methods</u></p>	<ul style="list-style-type: none"> ✓ Students will be able to formulate problems, do appropriate research and devise solutions (e.g. construct gadgets).
<p>Nature Of Technology</p>	<ul style="list-style-type: none"> ✓ Look at past inventions in their historical context. ✓ Understand that products are replicable. ✓ Understand that others may be working on the same idea. ✓ Realise that <i>they can use scientific knowledge in doing</i> technology and that technology helps to develop reliable scientific information. ✓ Understand the importance of precision and safety in developing new products. ✓ Understand that technology is novel and creative. ✓ Understand that if the people in a country are creative and innovative, their country can progress. ✓ Understand that people use processes involving living things (Biotechnology) and materials (Production Technology) to satisfy their needs.
<p><u>Use Of Technology</u></p>	<ul style="list-style-type: none"> ✓ Appreciate the use of devices, tools and structures made by humans in the home and community. ✓ Appreciate the advantages of using these products. ✓ Realize that human-made things can pollute the environment. ✓ Look at advantages and disadvantages to help them make decisions of what is the best technology that can be used in a particular situation. ✓ Realize that people may abuse and misuse technology. ✓ Understand that technology may have unintended consequences.

Unit: DIVERSITY AND CLASSIFICATION (Grade 5)

Topic: Reproduction in Animals

DURATION: 6 Lessons

OBJECTIVES

The students should be able to:

1. Name different animals and state the method by which they reproduce.
2. Explain the need for reproduction.
3. Explain what the life cycle of an animal is.
4. Describe the life cycle of an animal where the young and adult are alike (cockroach).
5. Describe the life cycle of an animal where the young and adult are not alike (butterfly).
6. Classify insects according to their type of life cycle.
7. Describe the role of the butterfly in nature.
8. Compare the human life cycle to that of another animal.

Process Skills

Observing, Measuring, Recording, Classifying, Communicating, Experimenting, Interpreting

Materials

Charts of stages in human development.

Hand lens, glass jars, leaves for feeding insects, insects' eggs, frogs' eggs.

Content Summary

Animals reproduce in different ways:

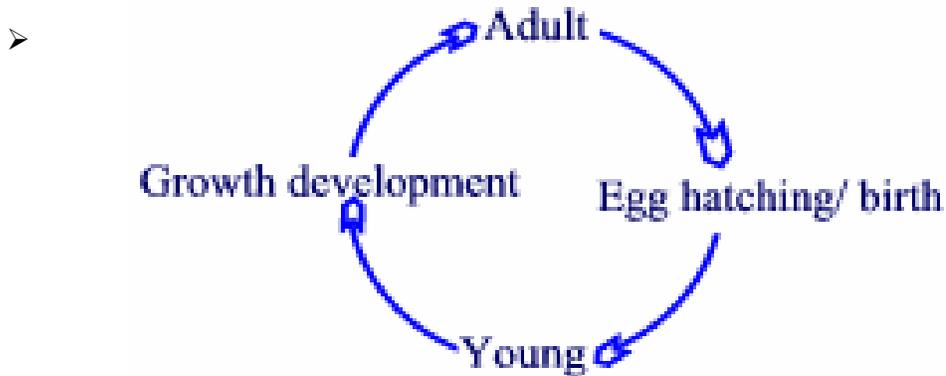
- e.g. birds, some fishes, insects lay eggs
- Mammals and some fishes give live birth
- Earthworms – segments

Reproduction is necessary to ensure the survival of the species.

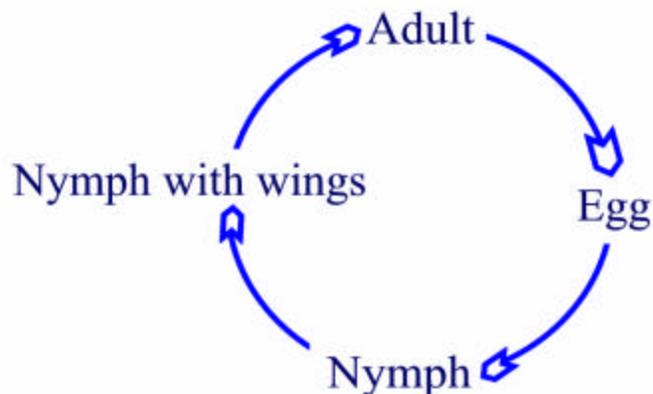
Living organisms produce young ones. The young ones grow and develop into adults. These adults in turn produce more young. This period of growth

from young to adult with all its changes is known as the life cycle of the organism

A typical life cycle:

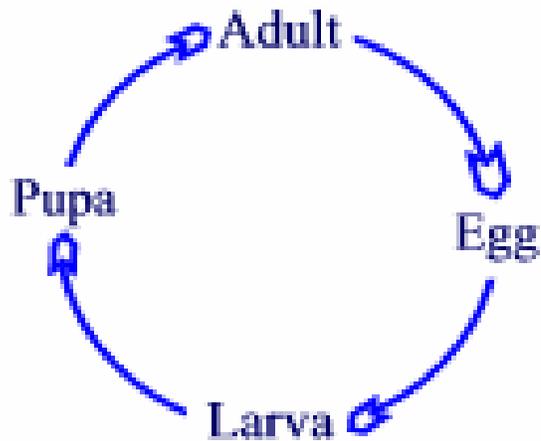


- Some young insects (nymph) look like their parents; the only difference is that they are smaller. They change into adult insects e.g. cockroach



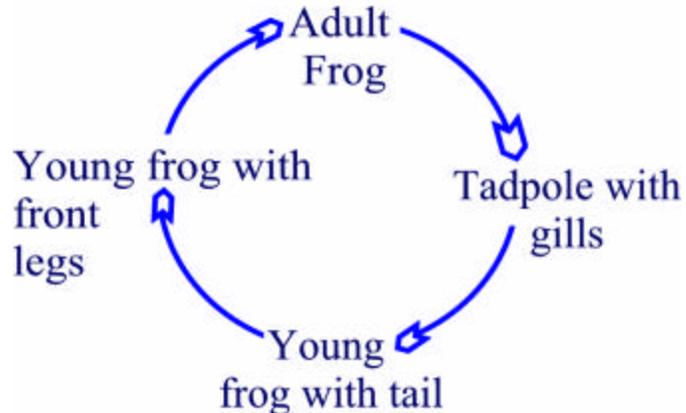
Life Cycle of a Cockroach

- Some young insects do not look like their parents at all. The egg hatches into a larva. The larva feeds and grows, then it stops feeding and changes into a pupa. Inside the pupa an adult insect forms and eventually emerges, e.g. butterfly. See the following diagram.



Life cycle of butterfly

- Young frogs do not look like their parents at all. The egg hatches into a tadpole which lives in water and breathes by means of gills. As the tadpole grows its gills disappear. It grows a pair of hind legs and later a pair of front legs. The tail gets shorter and in the end disappears completely.



Life cycle of frog

- Human baby is born alive and looks like its parents
- Main changes are in size and characteristics, such as growth of facial hair.

Activity

1. Students investigate the life cycle of a butterfly.
Students collect butterfly's eggs and keep them in transparent jars for observation.
Students describe the characteristics of the different stages of the life cycle.

Students record the length of time for changes from stage to stage.
Students report on their observations.
2. Students complete diagrams of life cycle.
Small group discussion
At what stage of the life cycle is it easiest to control the butterfly?
Why would you want to protect plants from butterflies?
What can be used to protect plants from butterflies?
3. Students arrange stages in the life cycle of named animals in order.
4. Students complete tables of comparison of life cycle of humans and named animals.

Feature	Humans	Named animals
Resemblance of young to adult	(Looks like/Does not look like)	(Looks like/Does not look like)
Changes in feeding	(No change/Change)	
Nature of growth	(Simple/Moulting)	(Simple/Moulting)
Type of movement	(No change/different type of movement)	(No change/different type of movement)
Development	(Gradual/Different stages)	(Gradual/Different stages)

5. Classifying animals according to whether the young look like the parents or do not look like the parents .

Assessment

Many of the activities listed above can be assessed as the students engage in them.
Written or oral descriptions of stages in the life cycle of animals from specimen or drawings.

Students make checklist of features shown by different stages in the life cycle of named animals.

Checklist

Stage	Feature			
	Gills	Back legs	Front legs	Tail
Newly hatched tadpole				
Large tadpole				
Immature frog				
Adult frog				

Objective type questions

Example: Nymphs occur in the life of

- A. Butterfly
- B. cockroach
- C. frog
- D. human

Open-ended questions e.g. How are butterflies important?

Unit: DIVERSITY AND CLASSIFICATION (grade 6)

Topic: Pollination and Fertilization

Duration: 4 Lessons

Specific Objectives:

Students should be able to:

1. Define pollination, cross-pollination and self-pollination.
2. Describe the processes of (i.) self-pollination and (ii.) Cross-pollination .
3. Distinguish between self-pollination and cross-pollination.
4. Classify flowering plants according to the type of pollination they undergo.
5. Name the agents of pollination.
6. Identify pollen grains and ovules as the reproductive cells/gametes in a flower.
8. Define fertilization as the fusion of male and female gametes.
9. Explain how fertilization occurs in a flower.
10. Appreciate the significance of the processes of pollination and fertilization in plants, as a means of obtaining seeds.

Process skills

Observing, Classifying, Communicating, Manipulating

Materials

Chart (diagram of flower)
Flowers

Activities

1. Use text/listen to lecture to find out what are pollination and fertilization.
2. Discuss the various means by which pollen may be transferred from one flower to another.
3. Examine a flower and locate the reproductive parts (pollen grains, stigma style and ovary).
4. Indicate the location of pollen grains and ovules on a diagram of a flower and trace the path from the stigma to the ovary of a flower.
5. Discuss why farmers sometimes have to transfer pollen for themselves.

Assessment

1. Answer the following questions.
 - a) Give the meaning of (i.) pollination (ii.) fertilization.
 - b) List the reproductive parts of a flower.
 - c) Identify the male and female reproductive cells that are present in a flower.
 - d) Briefly explain how pollen grains are transferred to the stigma of a flower.
 - e) Distinguish between self-pollination and cross-pollination.
 - f) Make a drawing of the reproductive parts of a flower. Show the path of the pollen tube .
 - g) Explain why the processes of pollination and fertilization are important.

Topic: Seed Dispersal

Duration: 2 Lessons

Specific Objectives

Students should be able to:

1. Define 'seed dispersal'.
2. List the agents of seed dispersal and give examples of seeds that are dispersed by each method.
3. Explain why it is important for seeds to be dispersed/scattered.

Process skills

Observing, Classifying, Investigating, Communicating

Materials

Seeds (mahogany, burr grass, coconut, sandbox, warri)
Worksheets (*match the type of seed to its method of dispersal*)

Content Summary

The **scattering** of seeds is called **dispersal**. These include **self**, **animals**, **wind** and **water**. Self dispersal means that the seeds are dispersed by the plant itself (e.g. sandbox, warri/nickel). In animal dispersal, seeds are scattered by animals. In wind dispersal the wind disperses the seeds and in water dispersal seeds, are dispersed by water.

Activities

1. Examine a number of different seeds. Discuss how they are scattered/dispersed and link their physical structure to the way in which they are scattered in nature. Record the findings in a table. (Look for weight, wing-like structures, spurs, whether animals eat them).

2. Use a text/chart to find out about the methods by which seeds are scattered. List the methods and name two examples of seeds that are dispersed by each method.
3. Write a short story called "the journey of a (named) seed", to depict any one of the dispersal methods.

Assessment

1. Complete matching exercise in which each type of seed is matched to its method of dispersal.
2. Grade the short story, "The Journey of a Seed".
3. Draw lines to match each type of seed to its method of dispersal.

<u>Type of seed</u>	<u>Agent of dispersal</u>
coconut	
guava	Wind
mahogany	Water
burrs (grass)	Self
sandbox	Animals

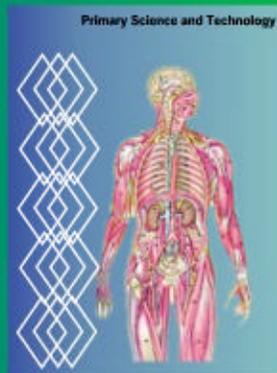
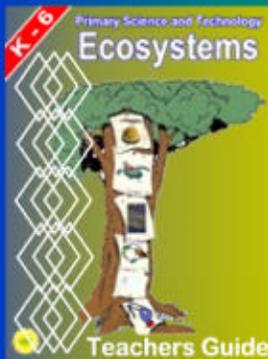
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